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IS 12400 (1988): Code of practice for selection of electromagnetic feeders [MED 6: Continuous Bulk Conveying, Elevating, Hoisting Aerial Ropeways and Related Equipment]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

(Reaffirmed 1998)

CODE OF PRACTICE FOR SELECTION OF ELECTRO-MAGNETIC FEEDER

1. Scope — Covers the general code of practice followed for selection of electro-magnetic feeder.

2. Selection Criterion — Generally, the following influence the selection of a feeder:

- a) Material, its bulk density, largest lump size and moisture content;
- b) Sieve analysis (approximate value may also be helpful);
- c) Capacity in tonne per hour;
- d) Angle of repose of material;
- e) Layout of hopper; and
- f) Ambient temperature.

3. Size of Feeder — Size of feeder depends, mainly, upon the velocity of material on feed pan (capacity in tonnes per hour). The velocity is used to determine the width of the feeder and average depth of material on the trough for a given capacity in tonnes per hour of a material of given density.

3.1 An example is given below to determine the effective width inside the skirts of feeder and average depth of bed material on the trough for velocity of material on feed pan for a given capacity of a material of given density.

Example:

$$Q = 60 \times W \times D \times V \times \rho$$

where

Q = capacity in tonnes per hour,

W = effective width inside the skirts of feeder trough in metres,

D = average depth of material on feeder pan in metres,

V = velocity of material on feeder pan in metre per minute, and

ρ = bulk density of material in tonnes/m³.

Note 1 — Velocity shall be arrived at considering the inclination of pan, stroke, frequency and moisture content.

Note 2 — Velocity of material on pan is normally 9 m/min at pan inclination of 10° down-hill.

3.1.1 Choosing W and D — In 3.1, two unknowns, namely, W and D are there and for a given capacity for a given material, a trial selection of width of feeder (W) shall give the average depth of material (D), and the width shall be adjusted until both W and D are reasonable.

3.1.2 Skirt plates may be used, attached to the hopper outlet to contain a depth of material greater than the depth of the trough sides.

3.2 Normally, the width of the feeder is governed by the velocity of material on feed pan (capacity in tonnes per hour) required. Sometimes, however, the size of the material in the feed influences the width of the feeder.

3.2.1 No straight formula exists for relating the size of the pieces with the feeder width and to arrive at a decision, judgement (based on experience) may have to be used. For example, if a high proportion of large pieces is to be handled, the feed width shall be about two to three times the size of these pieces to avoid jamming of the material in the hopper outlet to the feeder. On the other hand, if the large pieces are occasional, the width may be determined by the tonnage to be handled provided that the large pieces could be accommodated with reasonable clearance in the width.

3.2.2 It shall be worth consideration that clearance in the hopper outlet to the feeder is required and this outlet shall be narrower than the width of the feeder. Generally, a working

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Gr 2

clearance of 30 to 40 mm is required between the vibrating trough and the hopper outlet; on a large feeder, this clearance plus stiffening ribs, etc., on the hopper outlet may reduce the effective width (inside the skirts) by 150 mm or more below the feeder width.

3.3 Length of Feeder Trough — The length of a feeder trough is related to several factors which are considered while determining this, namely, velocity of material on feed pan (capacity in tonnes per hour) to be handled, size of material in the feed, occasionally by the type of duty required of the feeder, and possibly by the user's specification to suit the site requirements.

3.3.1 No straight formula exists to determine the length, of trough and to arrive at a decision judgement (based on experience) may have to be used and following may be useful for guidance to obtain a suitable trough length.

3.3.1.1 The depth of the material (D) (see 3.1) is the depth at the point towards the discharge and just before the material begins to fall away. The depth at the throat of the outlet shall be rather more than this to cater for a slight tapering off in depth as the material travels along the feeder, and also a greater throat depth shall sometimes be necessary to cater for large pieces in the feed.

3.3.1.2 A schematic diagram shown in Fig. 1 as illustration only may be made to scale showing the trough bottom inclined at 10° (the normal angle of installation for electro-magnetic feeders) to the horizontal with a line from the point as obtained in 3.3.1.1, representing the top of the throat of the outlet inclined at the angle of rest of the material shall be drawn to cut the line of the trough bottom. The length of the feeder trough bottom shall be extended beyond the angle of rest of material by an amount sufficient to cut off the flow of material.

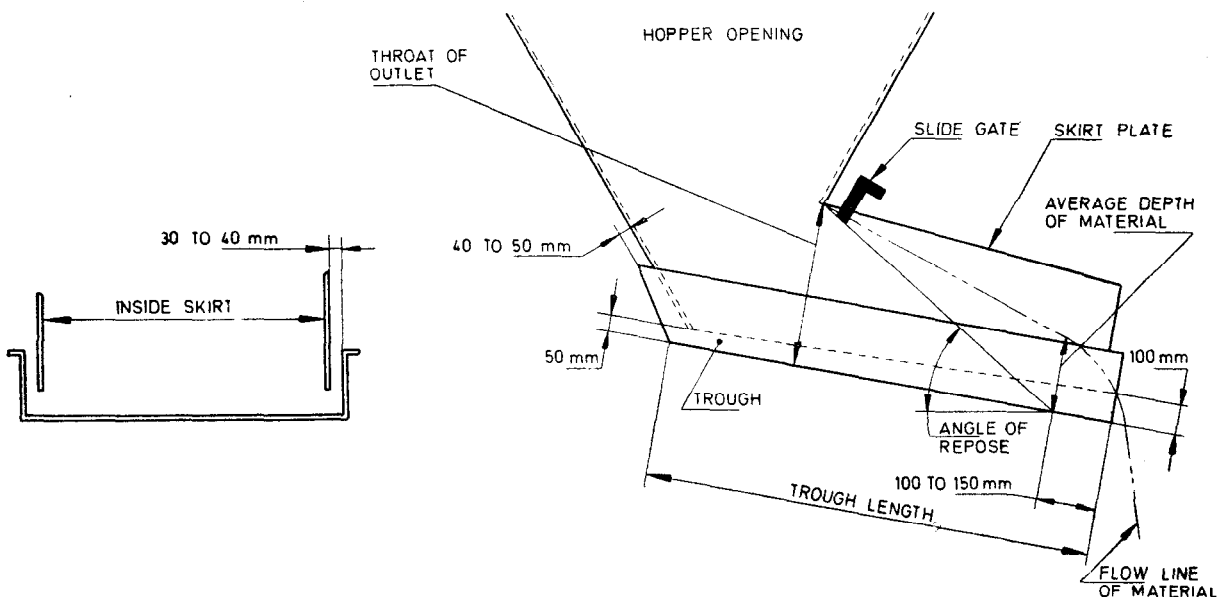


FIG. 1 FLOW LINE DIAGRAM OF MATERIAL

3.3.2 For a given capacity (tonnage per hour), large material obviously requires a longer trough to control the cut-off of flow than does small material.

3.3.3 If the feeder is below a large bunker seldom completely emptied, a shorter feeder may be used than would be advisable with, for example, surge hopper or wagon tippler hopper liable to be emptied frequently during wagon marshalling, etc, where the first tip into an empty hopper is liable to flush over the feeder; in a case like this, arrangements shall be made to cut-off the feeder before the hopper is completely empty.

3.4 Compatibility with Vibrator — Having decided upon a suitable width and length of feeder, reference shall be made to data sheets, with the consideration of the indicated capacities of the respective vibrators. These capacities are fairly near the upper limit for the vibrators and if a long feeder is required, or rather difficult material is to be handled at a capacity near that shown, then the next larger size vibrator shall be used, and a feeder selected from the next range. An overlap

occurs in the feeder widths on each range of sizes to enable the most suitable vibrator to be used for any given capacity in tonnes per hour and the material.

3.5 In general, twin and triple vibrator feeders are used for special installations and may be disregarded in the ordinary run of work.

EXPLANATORY NOTE

This Indian Standard is intended to provide a uniform practice for selection of electro-magnetic feeder. The information given in this standard may be useful to the manufacturers in deciding the various parameters of the feeder and to the users in the selection of feeder(s) for their specific requirement(s).

For very sticky material, the use of electro-magnetic feeder is not recommended.